

What is claimed is:

1. A method, comprising

5 determining that a device related operation happens in a virtual machine by
a kernel component of a virtual machine monitor through an operation transition
from the virtual machine to the kernel component; and

determining whether the device related operation can be handled by a first
virtual input/output device installed inside of the kernel component of the virtual
machine monitor.

10

2. The method of claim 1, wherein the first virtual input/output device
comprise at least one of virtual keyboard, virtual mouse, virtual audio device,
virtual video device.

15

3. The method of claim 1, wherein the virtual machine monitor is a hybrid
virtual machine monitor.

4. The method of claim 3, wherein the kernel component is a hypervisor of
the hybrid virtual machine monitor.

20

5. The method of claim 1, wherein the virtual machine monitor is a host
virtual machine monitor.

25 6. The method of claim 5, wherein the kernel component is an in-kernel
virtual machine monitor of a host operating system.

7. The method of claim 1, further comprising:

passing the device related operation to a second virtual input/output device installed outside of the kernel component of the virtual machine monitor, in
5 response to determining that the device related operation can not be handled by the first virtual input/output device.

8. The method of claim 1, further comprising:

initiating an interrupt by the first virtual input/output device; and
10 injecting the interrupt from the first virtual input/output device to the virtual machine through another operation transition from the kernel component to the virtual machine.

9. A virtual machine monitor, comprising a kernel component to determine
15 that a device related operation happens in a virtual machine through an operation transition from the virtual machine to the kernel component, wherein the kernel component further comprises a first virtual input/output device.

10. The virtual machine monitor of claim 9, wherein the first virtual
20 input/output device comprise at least one of a virtual keyboard, virtual mouse, virtual audio device and virtual video device.

11. The virtual machine monitor of claim 9, wherein the virtual machine monitor is a hybrid virtual machine monitor.

12. The virtual machine monitor of claim 11, wherein the kernel component is a hypervisor of the hybrid virtual machine monitor.

13. The virtual machine monitor of claim 9, wherein the virtual machine
5 monitor is a host virtual machine monitor.

14. The virtual machine monitor of claim 13, wherein the kernel component is an in-kernel virtual machine monitor of a host operating system.

10 15. The virtual machine monitor of claim 9, further comprising:
a second virtual input/output device installed outside of the kernel component of the virtual machine monitor to handle the device related operation in response to determining that the device related operation can not be handled by the first virtual input/output device.

15 16. The virtual machine monitor 9, wherein the first virtual input/output device is further to initiate an interrupt and inject the interrupt from the first virtual input/output device to the virtual machine through another operation transition from the kernel component to the virtual machine.

20 17. A machine-readable medium comprising a plurality of instructions which when executed result in an apparatus:

determining that a device related operation happens in a virtual machine by a kernel component of a virtual machine monitor through an operation transition from the virtual machine to the kernel component;

determining whether the device related operation can be handled by a first virtual hardware device installed inside of the kernel component of the virtual machine monitor; and

- 5 passing the device related operation to a second virtual hardware device installed outside of the kernel component of the virtual machine monitor, in response to determining that the device related operation can not be handled by the first virtual hardware device.

- 10 18. The machine-readable medium of claim 17, wherein the first virtual hardware device comprises at least one of virtual input/output device, virtual interrupt controller, and virtual event timer.

- 15 19. The machine-readable medium of claim 17, wherein the second virtual hardware device comprise at least one of virtual input/output device, virtual interrupt controller, and virtual event timer.

- 20 20. The machine-readable medium of claim 17, wherein the virtual machine monitor is a hybrid virtual machine monitor.

- 20 21. The machine-readable medium of claim 17, wherein the kernel component is a hypervisor of the hybrid virtual machine monitor.

- 25 22. The machine-readable medium of claim 17, wherein the virtual machine monitor is a host virtual machine monitor.

23. The machine-readable medium of claim 17, wherein the kernel component is an in-kernel virtual machine monitor of a host operating system.

24. The machine-readable medium of claim 17, wherein the plurality of
5 instructions further result in the apparatus:
initiating an interrupt by the first virtual hardware device; and
injecting the interrupt from the first virtual hardware device to the virtual
machine through another operation transition from the kernel component to the
virtual machine.

10